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Contents

General Articles :

The Toxicity of Rodenticides I.–Sodium Fluoroacetate, Antu and Warfarin 124
J. L. McGirr, B.SC., M.R.C.V.S.
D. S. Papworth, M.SC.

Suspected Infectious Avian Encephalomyelitis in Poultry in Britain : A Preliminary Report 131
L. M. Markson, M.R.C.V.S.
J. D. Blaxland, M.R.C.V.S.

Isolation of *Bacillus anthracis* from Soil : the Use of Pearce and Powell Selective Medium ... 132
C. A. McGaughey, M.A., M.SC., M.R.C.V.S., D.V.S.M.
C. St. George, B.V.SC. (Madrás)

Current Literature 134

Abstracts :
W.H.O. Technical Report Series
Newcastle Disease Virus in Man
Living Modified Viruses as Immunising Agents

Correspondence :

A Legitimate Grievance... ... 138
J. A. Douch, M.R.C.V.S.

Salmonella manhattan Infection 138
E. A. Gibson, B.SC. (LOND.) M.R.C.V.S.

Rhododendron Poisoning ... 138
J. F. Bolton, B.V.SC., M.R.C.V.S.

The Scheme for Animal Nurses 139
J. S. Steward, F.R.C.V.S., D.V.S.M.

Equine Radiography 139
V. Berwyn Jones, M.R.C.V.S.

Pyometra 140
G. T. Wilkinson, M.V.SC., M.R.C.V.S.

Sixpence per C.C. 140
John B. Edwards, M.R.C.V.S.

New Salary Scales for State Veterinary Officers

THE Civil Service Arbitration Tribunal has awarded new salary scales to Veterinary Officers of the Ministry of Agriculture and Fisheries. The case for the Association of State Veterinary Officers was prepared by the Institution of Professional Civil Servants, and the Association's representatives at the Tribunal hearing were:—

Mr. Stanley Mayne, General Secretary, I.P.C.S.; Mr. A. W. Stalley, Assistant Secretary, I.P.C.S.; Mr. J. D. Blaxland, President, A.S.V.O.; Mr. E. G. Morris, Hon. Sec., A.S.V.O. The Official Side team was led by Mr. C. T. Houghton, C.B., C.B.E., Principal Establishment Officer.

The Civil Service Arbitration Tribunal met in London on January 13th, the matter having been referred to them for settlement in accordance with the agreements for arbitration in the Civil Service.

On behalf of the Association of State Veterinary Officers it was pointed out that the basic salary scales of the grades concerned in the claim came into operation on November 1st, 1950, and were of the same general order as those applying in the Civil Service, other than in the Works Group and the Professional Accountants classes. Since that time the grades concerned in the present case had, in common with the rest of the Civil Service, the 1952 Pay Addition increase. (A central "Pay Settlement" Agreement, effective from July 1st, 1954, had been reached recently).

It was explained that on December 31st, 1952, the Official Side of the Civil Service National Whitley Council, having informed the Staff Side that they were not prepared to proceed further with negotiations for another Pay Addition on the lines of that agreed with effect from January 1st, 1952, it became necessary for all settlements to be made on an individual basis; and it was not possible for departmental grades to be effectively negotiated until settlements had been made for the main General Service and linked Departmental Classes.

The increases claimed by the Association averaged about 7 per cent. of present basic pay (*i.e.* pay excluding Pay Addition) and were roughly the same as those awarded to the Executive Class in October, 1953 (Award No. 231), with effect from January 1st, 1953. On the other hand, the increases offered by the Ministry were about 3½ per cent. of present basic pay and were roughly the same as those which the Tribunal awarded to the Works

(Concluded on page 133, col. 2)

The Toxicity of Rodenticides

I. Sodium Fluoroacetate, Antu and Warfarin

BY

J. L. McGIRR and D. S. PAPWORTH

Weybridge

IN an earlier paper (McGirr & Papworth, 1953) we reviewed the toxic hazards of the newer insecticides and herbicides and reported on the work which has been carried out in this laboratory on domestic livestock. It is intended to follow similar lines in respect of the dangers to agricultural workers and livestock from the newer types of rodenticides.

From earliest times man has waged war against rodents which he knew were responsible for food losses, and which should be eliminated whenever possible in view of the dangerous diseases and parasites for which they may act as vectors. The earlier methods of rodent eradication consisted of the stick or club, lethal gases, the cat, dog, mongoose or ferret, but these have an obviously limited effect when a large infestation has become established such as are commonly found in warehouse districts or food processing plants. For such heavy infestations poisoning has been the main weapon of attack for a long time, and such substances as arsenic, barium, strychnine, thallium, and red squill proved reasonably effective. The main difficulty encountered with all the earlier materials was the establishment of "poison shyness" which was often due to the relatively large amounts required in the food imparting a detectable odour or flavour, which made the animals suspicious of food baits so treated. In recent years several products have appeared on the market, often as a result of theoretical research along other lines than rodent eradication, and these newer rodenticides have their place with the older compounds; but, unfortunately for the veterinary surgeon, they have not proved much less toxic to domestic livestock. This makes their use on the farm a matter of caution by the farmer and herdsman, as much as for the more experienced rodent operative in charge of an eradication programme.

Sodium Fluoroacetate

Sodium fluoroacetate was identified as an effective rodenticide during a large-scale investigation in the U.S.A. during 1943 to 1944 (Kalmbach, 1945).

It is prepared either by the interaction of sodium fluoride and sodium monochloroacetate, or by the reaction of carbon monoxide, hydrogen fluoride and formaldehyde at high pressure to give fluoroacetic acid. The pure salt is a light, white crystalline compound, odourless and tasteless. It is very soluble in water, but of low solubility in alcohol, acetone, and petroleum oils.

Table I summarises the various reported LD_{50} values by other authors. Although the material is an effective rodenticide it is also dangerous to other animals, and of these, the cat, dog, pig, and goat are very susceptible.

Chenoweth & Gilman (1946) have studied the mechanism of action of fluoroacetate and found that it exerted an effect upon the heart and central nervous system. Ventricular arhythmias, marked ventricular alteration, myocardial depression, and ventricular fibrillation follow fluoroacetate administration in goats, horses, rabbits, and monkeys. Convulsions always occur without parallel cardiac abnormalities in the dog and guinea-pig, but the cat, pig, rat, hamster, and monkey manifest both cardiac and CNS responses.

When rats have been poisoned by this compound, symptoms begin to appear after 20 minutes, and the animals generally die within a few hours according to Dieke & Richter (1946). Secondary poisoning of cats, dogs or other animals which may gnaw or eat the rat carcases is therefore a possibility, especially since the bodies remain contaminated after drying or decay. Gilcreas (1950) has reported the death of about 20 dogs and cats by this means around a village dump where fluoroacetate baits had been placed deep in rat burrows. Fluoroacetate appears to have the common disadvantage of many poisons due to the appearance of poison shyness among rats which have survived poisoning by this material (Barnett & Spencer, 1949).

There are few antidotes for treating poisoning by fluoroacetate, although Hughes (1947) has described symptomatic treatment for such cases. The induction of vomiting, the careful use of barbiturates for control of nervous system excitation, and intracardiac injection of procaine hydrochloride should ventricular fibrillation occur are the main recommendations. Tourtelotte & Coon (1951) have reported that dogs which had been orally poisoned with twice the LD_{50} of fluoroacetate were invariably saved when barbiturate treatment was started 30 minutes or three hours after poisoning. Those animals recovering amounted to only 17 per cent. when this treatment was commenced more than three hours after poisoning. Barbiturate treatment was unable to save dogs poisoned with six times the LD_{50} even if commenced 30 minutes after poisoning.

Chenoweth *et al.* (1951) found that glycerol monoacetin would avert death when injected shortly after a lethal dose of fluoroacetate. Gitter, Blank, & Bergmann (1953) have used acetamide for protection with similar success. Peters (1954) has recently published an interesting paper on the biochemistry of fluoroacetic acid, the toxic principle

TABLE I

REPORTED TOXICITY VALUES OF FLUOROACETATE (ORAL ROUTE)

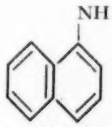
Animal	Number used	LD_{50} mg. per kg.	Authority
Mouse ...	—	7–10	U.S. Public Health Service (1949)
Rat ...	97	4–5*	Chenoweth & Gilman (1946)
(various	—	1·42	McDougall (1949)
species)	—	2·23	„ („)
	—	4·46	„ („)
	—	5·62	„ („)
	—	1·00	Ward (1946)
	—	1·5–7·0	U.S. Public Health Service (1949)
Frog ...	—	300	Chenoweth & Gilman (1946)
Guinea-pig	70	0·35	„ „ („)
	—	0·3–0·4	Ward (1946)
Hamster...	20	2·5–5·0	Chenoweth & Gilman (1946)
Chicken ...	—	10–30	Insect Control Committee,
(R.I.R.)			Washington, D.C. (1946)
			Chenoweth & Gilman (1946)
Rabbit ...	200	0·20–0·25	„ „ („)
		0·3	Ward (1946)
		0·4	Woodard (1946)
Cat ...	24	0·5	Chenoweth & Gilman (1946)
		0·3	Ward (1946)
		0·3–0·5	U.S. Public Health Service (1949)
Dog ...	31	0·06	Chenoweth & Gilman (1946)
	—	0·35	Kalmbach (1945)
	—	0·1–0·2	Ward (1946)
	—	0·1	Woodard (1946)
	—	0·07–0·20	U.S. Public Health Service (1949)
Pig ...	28	0·4	Chenoweth & Gilman (1946)
	—	0·3	Ward (1946)
	—	0·3	U.S. Public Health Service (1949)
Goat ...	—	0·3–0·7	U.S. Public Health Service (1949)
	24	0·60	Chenoweth & Gilman (1946)
	—	0·70	Ward (1946)
Sheep ...	12	0·25–0·50	Ward *et al.* (1948)
Horse ...	2	0·50–1·75	Chenoweth & Gilman (1946)
	—	1·0	Ward (1946)
	—	1·0	U.S. Public Health Service (1949)
Monkey ...	43	4·0	Chenoweth & Gilman (1949)
(various	16	14·0	„ „ („)
species)	—	5·0–7·5	Ward (1946)
	—	10·0–12·0	„ („)
Man ...	—	2·5?	U.S. Public Health Service (1950)

* Methyl fluoroacetate used, to avoid errors due to fluoride ion contamination of the sodium salt.

of the South African plant *Dichapetalum cymosum*. It should be noted that fluoroacetate is not favoured for general use as a rodenticide.

Alphanaphthylthiourea, ANTU

This rodenticide was first isolated by Richter (1945) towards the end of the war.



N-(1-Naphthyl)thiourea (Antu).

It is a white crystalline material (although the commercial product is usually a grey powder) with a melting-point of 198° C., insoluble in water, and possessing little taste or odour.

Table II shows the toxicity levels of ANTU to various species which have been reported by other workers. The major point of interest with respect to the toxicity of ANTU is the wide species difference in susceptibility. ANTU is the only one of the newer rodenticidal poisons to exhibit this widespread species difference in toxicity, and it should also be noted that ANTU is only effective for the Norway rat, other species showing a relatively greater resistance. The usual baits are cereals, sausage or bread mash containing 2 per cent. ANTU by weight; it is readily acceptable to the animals, but they are able to develop a tolerance towards the substance many times that of the lethal dose even after the consumption of a single sublethal dose (Dubois, 1948). It kills by producing marked hydrothorax and pulmonary oedema with profuse pleural, and, to a lesser extent, pericardial effusion.

Dogs were among the first animals to be tested after rats for the toxicity of ANTU. Richter (1945) observed that when the poison was administered in food to dogs under laboratory conditions a number were observed to vomit and rid themselves of the poison, retching was also observed in dogs after intravenous administration of ANTU; this leads to the assumption that the compound has an emetic quality which would help protect dogs from poisoning. We have tested the toxicity of ANTU on three dogs in order to study the symptoms and *post-mortem* findings. From the dose levels used, the values reported in Table II would appear reasonable, although the range may be wider taken over all types of dogs.

Dog 93, weighing 7.7 kg., was given a capsule containing a dose of 20 mg. per kg. of ANTU at 11 a.m. By 5 p.m. the same day no abnormality had been detected. At midnight there was some evidence of respiratory distress and of fluid in the chest. The animal was found dead at 8 a.m. the next morning, with a watery, blood-tinged discharge from the nose. *Post-mortem* examination revealed the presence of some 200 ml. of exudate in the thoracic cavity, and the lungs were oedematous and very congested. The blood was found to be thick and tarry in nature, and the gut contents were sticky and mucoid in appearance. The kidneys, liver, and spleen were small, firm and dehydrated.

Dog 94, weighing 16 kg., was given a capsule containing the equivalent of 20 mg. per kg. of ANTU at 11 a.m. At 5 p.m. the animal appeared normal

TABLE II
REPORTED TOXICITY VALUES OF ANTU (ORAL ROUTE)

Animal	LD_{50} (mg. per kg.)	Authority	LD_{100} (mg. per kg.)	Authority
RAT				
Adult Norway ...	6–8	Ward (1946)	—	—
Young „ ...	20–50	Richter *et al.* (1945)	—	—
R. rattus	250	U.S. Public Health Service	—	—
ALBINO MICE	70	Munch (1947)	—	—
GUINEA-PIG	143	Dubois (1948)	400?	A.R.C. Report (1945)
RABBIT	> 200	„ („)	—	—
	> 370	A.R.C. Report (1945)	—	—
CAT	500	Dieke *et al* (1946)	100	U.S. Public Health Service (1949)
	75–100	Vashkov, V. I. (1944)	—	
DOG	38	Dieke *et al.* (1946)	16	
	10–15	A.R.C. Report (1945)	—	
CHICKEN	2,500–5,000	„ („)	5,000	
	4,250	Dieke & Richter (1946)	—	
PIG	37·5	Anderson & Richter (1946)	50	
	25–50	A.R.C. Report (1945)	—	
MONKEY	3,500–5,000	U.S. Public Health Service	—	—
	4,250	Dieke & Richter (1946)	—	—
	> 200	Dubois (1948)	—	—
MAN	4,000?	U.S. Public Health Service	—	—

in all respects, but was found dead at 8 a.m. the next morning. *Post-mortem* study revealed a large amount of clear fluid present in the thorax, and fluid was also present in the pericardium. The lungs were heavily congested, and a frothy fluid was present in the trachea and bronchi. The heart, liver, and kidneys were normal but the spleen had a dry appearance. No other abnormalities were noted.

Dog 99, weighing 12.7 kg., was given a capsule containing the equivalent of 40 mg. per kg. at 11 a.m.; no abnormalities were detected throughout the day and the animal was still alive next morning. It appeared a little dull, but duly recovered, and a week later was given a duplicate dose. The animal survived the repeat dose quite happily, and was then shot for *post-mortem* examination which proved negative. Pathological examination of the lungs, however, showed the following locally variable changes: hyperaemia, oedema, haemorrhage, a little purulent bronchitis and hyperplasia of peribronchial lymphatic tissue.

We made a more extensive study of ANTU toxicity in pigs, and Table III provides an outline of this work. A chemical examination of tissues and fluids for the presence of ANTU was also attempted with pigs. The extraction procedure described by Jones *et al.* (1949) was used in combination with Dybing's colour test (1947), since this was found more sensitive than the Grote reaction described by Jones. If ANTU is present in sufficient quantity, it can be detected by the above method, but only if death has occurred within 24 hours of dosing. If a longer period elapses before death, we find tests are uniformly negative. The *post-mortem* picture with pigs is similar to that normally found with this poison. Conclusions reached were: (a) that doses of 40 mg. per kg. or more may be fatal (equivalent to a 1½ oz. bait for a 20 kg. pig); (b) the chemical test is not reliable unless there is a large amount of ANTU present and death occurs within 24 hours of dosing; and (c) repeated consumption of sub-toxic doses up to 28 mg. per kg. does not produce symptoms or lesions.

ANTU was also fed to two calves by oral capsules. The first animal received a single dose of 15 grammes of the pure material. No harmful effects were observed, and *post-mortem* examination revealed the absence of lung oedema, but the gut contents were dry and the liver presented a dehydrated appearance. The second animal received a single dose of 30 grammes. No symptoms were observed and *post-mortem* examination was negative.

There are several good papers dealing with the physiology of ANTU poisoning, and it seems worth mentioning the reasons why this compound was originally selected as a rodenticide. According to Richter (1942-3) interest in thiourea derivatives as rat poisons arose indirectly from studies on the self selection of diets. It was found that rats were capable of choosing nutritive diets and avoiding harmful ones (Richter, 1939). This ability to make favourable dietary selections was lost when taste nerves were sectioned, and a conclusion was drawn that there is a connection between taste and nutritional or toxic values. To examine this theory the toxicity of various bitter substances was examined. One such substance was phenylthiourea, the reason for selection being that this compound tasted very bitter to

TABLE III
ANTU TOXICITY IN PIGS

Animal number	Animal weight, kg.	Dosage regime	Symptoms	Period before death or slaughter	*Post-mortem* findings	Chemical findings
A. 1	13·6	15 mg. per kg. 200 mg. ANTU in capsule By mouth	None	Alive and well, and normal growth	—	—
A. 2	13·6	30 mg. per kg. 400 mg. ANTU in capsule By mouth	„	Alive and well, and normal growth	—	—
A. 3	16·0	31 mg. per kg. 500 mg. ANTU in capsule By mouth	„	Alive and well, and normal growth	—	—
A. 4	16·0	47 mg. per kg. 750 mg. ANTU in capsule By mouth	„	Killed 4 days after dosing	Negative	Lungs — Liver — Stomach contents — Intestine contents — Urine —
A. 5	17·0	118 mg. per kg. 2·0 g. ANTU in capsule By mouth	None seen	Found dead 24 hours after dosing	300 ml. fibrinous straw coloured fluid in chest. 20 ml. similar fluid in pericardium. *Lungs*—apical emphysema and marked intestinal oedema *Intestine*—slight enteritis *Kidneys*—markedly congested	Stomach contents + + + Intestine contents + Thoracic fluid + +
A. 6	18·0	55 mg. per kg. 1·0 g. ANTU in capsule By mouth	„	Found dead 48 hours after dosing	As A.5 above—thoracic fluid volume 500 ml.	Stomach contents — Intestine contents — Lung — Thoracic fluid —
A. 7	19·0	53 mg. per kg. 1·0 g. ANTU in capsule By mouth	„	Found dead 24 hours after dosing	As A.6 above	Stomach contents + + + Intestine contents + Thoracic fluid +
A. 8	19·0	40 mg. per kg. 750 mg. ANTU in capsule By mouth	„	Found dead 24 hours after dosing	As A.6 and A.7	Stomach contents + + Intestine contents + Thoracic fluid —
A. 9	17·5	28 mg. per kg. 500 mg. ANTU in capsule By mouth Daily for three days	None	Killed 24 hours after last dose	Negative	Stomach contents + Intestine contents — Lungs —
A.10	24·0	10 mg. per kg. 240 mg. ANTU in capsule By mouth Daily for four days	„	Killed 24 hours after last dose	„	Stomach contents — Intestine contents — Lungs —
A.11	19·0	26 mg. per kg. 500 mg. ANTU in capsule By mouth	„	Killed 5 days after dosing	„	Stomach contents — Intestine contents — Lungs —

most humans, but there were some who could not taste it at all (Fox, 1932), and it had, therefore, been used for research in the field of genetics and sensory perception, and the inability to taste it was found to be inheritable as a Mendelian recessive (Blakeslee & Fox, 1932, Snyder, 1932). A test of the crystals on the tongues of rats resulted in their death and the toxic nature of thiourea was revealed. A subsequent screening of thiourea derivatives revealed ANTU as the most useful related compound, since it lacked the bitter taste of thiourea.

Extensive experiments have been carried out to try to elucidate the pathology and mechanism of action of ANTU. It is clear that with rats, dogs, and pigs, death is due to the development of a pulmonary oedema resulting in "drowning." This oedema is caused by a greatly increased permeability of the lung capillaries; no other organ appears to be affected. The acute effects of large intravenous doses of ANTU upon the lungs of dogs have been reported in an excellent paper by Drinker & Hardenburgh (1949). They summarised their findings:—

(a) One hour after the injection of ANTU there was evidence of increased lymph production in the lungs which continued for several hours.

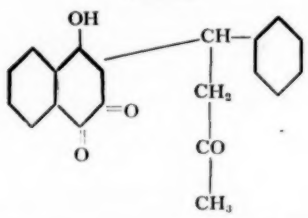
(b) The protein content of this lymph at first became greater, but during the last three hours of the experiment, whilst lymph flow was increasing rapidly the protein content slowly fell.

(c) Towards the end of the experimental period, minute volume of breathing rose from 5 to 15 litres, there were also indications of a high degree of terminal anoxia.

(d) Blood gas analyses indicated that the hyperpnoea of rapidly developing pulmonary oedema was peripheral in origin.

Jacques (1954) has shown that there is a relationship between lung histamine levels and pulmonary oedema in the rat. It was noted that older rats tended to have higher lung histamine values than young rats. This suggested that the relative tolerance of young rats to ANTU might be correlated with low lung histamine levels.

Warfarin



Warfarin, or 3-α-acetonylbenzyl)-4-hydroxycoumarin is a colourless, odourless, and tasteless crystalline compound with a melting point of 159° to 161° C. It is prepared by the condensation of 4-hydroxycoumarin with benzylacetone, and is insoluble in water and benzene, but moderately soluble in alcohols and acetone.

O'Connor (1948) appears to have been the first worker to use anti-coagulants as rodenticides. Diagne (1952) reported the use of dicoumarol (3:3-methylene-bis-4-hydroxycoumarin). Armour & Barnett (1950) showed that dicoumarol produced acquired "poison shyness," however, and this led to the introduction of Warfarin on the recommendation of Scheel *et al.* (1949).

Single doses of the anti-coagulants, unless very large, are unable to exert a lethal action. If repeatedly ingested in small amounts, however, they inhibit prothrombin formation, and prove fatal to animals by producing haemorrhages in the internal body tissues. Rat baits are usually made up by mixing one part of commercial preparations containing 0.5 per cent. or 0.1 per cent. Warfarin with 20 parts of oatmeal or other suitable diluent. Under field or laboratory conditions this type of bait kills the common rat in five to eight days. *Post-mortem* examination reveals extensive multiple haemorrhages throughout the body with considerable quantities of unclotted blood in the chest and abdominal cavities. Rats withstand single doses of 50 mg. per kg. bodyweight, but are killed by repeated dosing for five successive days with 1 mg. per kg. bodyweight. It has been suggested that secondary poisoning may occur if cats or dogs eat "several" Warfarin-poisoned rats over a period of days.

Table IV provides a summary on the toxicity of Warfarin to various animals which has been reported in the literature.

Our own experiments with poultry confirm the reported resistance of birds to Warfarin and it appears unlikely that harm could come to chickens as a result of eating rat baits. Toxicity levels in dogs appear to be very variable. We gave one dog weighing 12.7 kg. a capsule containing 1 mg. per kg. of Warfarin daily for four days. There were no signs of symptoms, and on the fifth day the animal was killed by the injection of nembutal into the heart. The blood clotting time at death was 30 minutes, and *post-mortem* examination revealed no abnormalities other than multiple discrete haemorrhagic areas approximately 0.5 cm. in diameter throughout the lungs. This was noted in several animals. Other dogs were found to survive 4.8 mg. per kg. and 25 mg. per kg. of Warfarin daily for four days. Blood-clotting times were depressed slightly but apart from the haemorrhagic lesions in the lungs, no other abnormalities were detectable on *post-mortem* examination.

Warfarin was also tested on a calf weighing 350 lb. A dose of 50 mg. per kg. bodyweight of the poison was given daily for 10 days without producing any symptoms, other than delayed clotting time. The dose was increased to 200 mg. per kg. on the 11th day and given daily for the remainder of the experiment. On the 23rd day the animal was dull and off feed. Faeces were observed to contain blood. On the 24th day blood was observed in both faeces and urine, and the faeces were very hard pellets. The animal was therefore shot. Blood clotting times were measured over this period by collecting blood in a McCartney bottle and observing visual signs of first clotting, and time of complete coagulation; these times are given in Fig. 1.

FIG. 1
CALF BLOOD CLOTTING TIME AFTER WARFARIN INGESTION (IN MINUTES)

Day	First sign of clotting	Complete coagulation
1	10	20
4	19	25
10	11	20
18	28	85
22	56	330

Post-mortem examination revealed an extensive subcutaneous haemorrhage over the rib region and smaller haemorrhages on the limbs and flanks. There were superficial haemorrhagic areas at the apex of the heart. Large haemorrhages were visible in the wall of the rumen, omasum, and wall of the large intestine. There were also some haemorrhages on the surface of the liver, but the kidneys and bladder appeared normal.

Table V shows the results of our toxicity tests of Warfarin on pigs. This work may be summarised into four main facts:

(i) Pigs are susceptible to Warfarin poisoning if dosage is sufficiently high, or often repeated.

(ii) No symptoms or autopsy findings were produced by a single dose of 3.3 mg. per kg. bodyweight (100 mg. for a 30 kg. pig or 15 oz. bait containing half an ounce of a commercial preparation of Warfarin bait per kg.).

(iii) Symptoms and death can be produced by repeated small doses of Warfarin, *e.g.* less than 0.4 mg. per kg. produced symptoms and death when given daily for a week (2.5 oz. bait per day for a 25 kg. pig).

(iv) Symptoms and lesions are variable, being dependent on accidental damage resulting from delayed blood-clotting time.

A single large quantity of bait, or repeated small amounts taken daily, would be required before symptoms developed.

The physiology of anticoagulants in general is applicable to Warfarin poisoning. It is a general mammalian poison when ingested or injected, but, so far as is known, has no inhalation or skin absorption hazards, and does not induce allergy. The antidote for Warfarin poisoning is massive doses of Vitamin K by oral administration until the clotting time returns to normal.

Summary

(1) The toxicity and physiological action of fluoroacetate is reviewed and discussed.

(2) The acute toxicity of ANTU for dogs was investigated and values agree with LD_{50} levels previously reported.

Experiments on the acute and chronic toxicity of ANTU for pigs in conjunction with a chemical examination of tissues and fluids for the presence of the poison showed: (a) that doses of 40 mg. per kg. bodyweight or more might be fatal; (b) that the chemical test is not reliable unless there is a large amount of ANTU present and death occurs within 24 hours of dosing; and (c) that repeated consumption of sub-toxic doses up to 28 mg. per kg. bodyweight does not produce symptoms or lesions.

(3) The acute and chronic toxicity of Warfarin for poultry, calves, dogs, and pigs was studied. Results showed that poultry and calves were very resistant to the quantities they are ever likely to be able to consume accidentally. Toxicity levels for dogs were variable, but it appeared that upwards of 4 mg. per kg. bodyweight per day for four days might be fatal. One or two dogs survived 25 mg. per kg. bodyweight for four days.

Toxicity tests of Warfarin for pigs showed: (a) that they are susceptible to poisoning if dosage is sufficiently high, or often repeated; (b) that no symptoms or findings were produced by a single dose of 3.3 mg. per kg. bodyweight; (c) that symptoms and death can be produced by repeated small doses of Warfarin; (d) that symptoms and lesions are variable.

TABLE IV
REPORTED TOXICITY VALUES OF WARFARIN (ORAL ROUTE)

Animal	Results	Authority
CAT	(i) Some survived single doses of 50 mg. per kg. and some were killed by single doses of 5 mg. per kg. Daily dosages of 3 mg. per kg. often proved fatal over three to four days	U.S. Fish and Wildlife Service (1949)
	(ii) No deaths from single doses of 7·5 to 50 mg. per kg. given in milk. No deaths or symptoms in animals receiving 2 mg. per kg. per day for five days	Kalmbach (1950).
DOG ...	(i) Single doses of 20 to 50 mg. per kg. may prove fatal to some dogs. Upwards of 3 mg. per kg. given on five consecutive days can be fatal	U.S. Fish and Wildlife Service (1949)
	(ii) 2 mg. per kg. per day for five days inhibited blood-clotting mechanism. Single doses of 20 and 25 mg. per kg. proved harmless and did not alter clotting time in each of two animals	Kalmbach (1950)
CHICKEN ...	(i) Resistant	U.S. Fish and Wildlife Service (1949)
	(ii) An adult chicken would require 50 per cent. or more of its weight in a feed containing 0·1 mg. per kg. to cause symptoms	U.S. Public Health Service (1949)
SHEEP (Ewes)	Single doses of 15 to 50 mg. per kg. produced no symptoms	Kalmbach (1950)
MAN ...	100 mg. of Dicoumarol, *not* Warfarin, daily for 9 to 10 days nearly killed a man (suicide attempt)	Wakes-Millar & Druckquer (1948)

TABLE V
WARFARIN TOXICITY IN PIGS

Animal number	Dosage regime	Symptoms	Period of dosing before death or slaughter	Autopsy findings	Remarks
W.1 12·8 kg.	62·5 mg. Warfarin per day in meal for 10 days	None until 5th day—thereafter mucoid diarrhoea, some bleeding from ear-tag, lameness with swellings over bony prominences fore and hind limbs	Killed by shooting on 10th day	Blood—watery, anaemic and did not clot for 24 hours. Large haematomas over bony prominences, limbs. Small subcutaneous haemorrhages, small sub-pleural haemorrhages	Dose 4·9 mg. per kg. per day for nine days.
W.2 13·7 kg.	Ditto	Ditto	Ditto	As above—but haemorrhages more marked and involving lungs	Dose 4·4 mg. per kg. per day for nine days.
W.3 15·9 kg.	250 mg. pure Warfarin by capsule as single dose	Some evidence small subcutaneous haemorrhages by third to fourth day. Lame with exudate over flanks	Killed on fifth day (this animal might have recovered)	Skin exudation partly due to mange — but wetter than usual. Blood did not clot but not so "watery" as 1 and 2. Extensive haematoma over right hock — multiple haemorrhages on diaphragm	Dose 15·5 mg. per kg.
W.4 18·2 kg.	62·5 mg. Warfarin per day in meal for three days	No symptoms	Killed six days after cessation of dosing	Blood did not clot for half hour, extensive superficial haematomas in muscles of hind and fore limbs	Dose 3·44 mg. per kg. per day for three days.
W.5 21·9 kg.	Ditto	Ditto	Killed 14 days after cessation of dosing	Blood did not clot for 20 min., small lung lesions and haemosiderin deposit spleen	Dose 2·9 mg. per kg. per day for three days.
W.6 27 kg.	10 mg. Warfarin per day in meal for six days	No symptoms until sixth day — then some blood from ear-tags and lameness right hind leg	Killed on seventh day	Blood did not clot for half an hour, extensive haematoma in muscles of right hind leg—small subcutaneous haemorrhages	Dose 0·37 mg. per kg. per day for six days.
W.7 26 kg.	10 mg. Warfarin per day in meal for seven days	No symptoms	Found dead on morning of eighth day	Blood did not clot for half an hour. Death due to extensive haematoma throat region, causing asphyxiation. Small haemorrhages over bony prominences	Dose 0·39 mg. per kg. per day for seven days.
W.8 30 kg.	100 mg. pure Warfarin by capsule as single dose	No symptoms	Killed on fourteenth day	None	Dose 3·3 mg. per kg.

Acknowledgments—We are grateful to the Director for his help. We are indebted to Dr. Turtle and Mr. Taylor, Infestation Control Division, Tolworth, for the gift of some pure Warfarin, and to Dr. Bentley and Mr. Davis of this Division for some technical advice. Mr. L. N. Ivins is acknowledged for technical assistance.

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(Continued at foot of col. 1, page 131)

Suspected Infectious Avian Encephalomyelitis in Poultry in Britain

A PRELIMINARY REPORT

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DURING the past four years a disease hitherto unrecorded in poultry in Britain has been seen in young chickens on several occasions. The most constant symptom is progressive paralysis of the legs. At first only slight ataxia is seen. As this increases in severity affected chicks have difficulty in standing and often flop down on the hocks without warning. Later they shuffle about on their shanks and ultimately lie helplessly on their sides, having lost all control over their legs. Even in this state, chicks drag themselves to the food and water troughs to eat and drink, and partial recovery of individuals may ensue if they escape death by trampling. In the later stages of paralysis intermittent tremors may be evident, most obviously in the head and neck; but this is not a constant feature of the disease. Such a picture is seen in groups of chicks and young growers between the ages of two and six weeks. Chicks which survive an outbreak present a sorry spectacle; growth and feathering are uneven and many birds are in poor condition. Morbidity varies between 5 and 50 per cent. and mortality among ailing chicks is high. The condition has been seen in adults on several isolated occasions. In these cases the symptoms described appeared less constantly; varying degrees of leg weakness and sometimes torticollis were seen.

There are no macroscopic abnormalities in the carcase. Microscopically there is a non-purulent encephalomyelitis characterised by perivascular accumulations of lymphocytes, focal gliosis and, less regularly, neuronal cell degeneration and endothelial proliferation in small blood vessels. Occasionally the blood vessels of the leptomeninges are affected. A visceral lymphocytic reaction is usually found in naturally occurring cases. This is most striking in the pancreas, where it occurs frequently, and is seen also in the proventriculus, gizzard, liver, and in the myocardium.

The disease has been transmitted by inoculating day-old chicks intracerebrally with an aqueous suspension of brain from clinically affected chicks. Attempts to isolate bacteria have been consistently negative.

Clinically and histologically this disease is indistinguishable from infectious avian encephalomelitis (" epidemic tremor " as it is popularly called) which is well known in the United States of America. The exact relationship between the British and American disease has yet to be established by serum neutralisation tests. The only other encephalomyelitis of virus origin known to affect poultry in Britain is seen in Newcastle disease. Differential diagnosis will be discussed in a future article. In view of the legislation relating to Newcastle disease, this must always be eliminated first; the haemagglutination inhibition test, egg inoculation, and histological examination are necessary to differentiate the two diseases.

So far there has been no evidence that this encephalomyelitis is a serious problem to the British poultry industry; but recent events indicate that the incidence of the disease has increased during the past few months. Tracings from recent outbreaks suggest the possibility of egg-born infection or of infection in the incubator. The purpose of this brief note is to report the existence of this disease in Britain A detailed account of the investigations being carried out at this laboratory will be prepared for publication in the near future.

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(Part Two of this Paper will be published next week.)

TURKEY FEDERATION CONFERENCE

Need for greater co-operation on the part of those engaged in the expanded turkey industry in this country if science is to have opportunity to reduce their losses from disease was emphasised by Dr. R. F. Gordon, Director of the Animal Health Trust's Poultry Research Station, when he spoke to the British Turkey Federation Conference at Eastbourne on February 3rd.

At a similar gathering two years ago, he recalled that he had called attention to the desirability of more material being submitted for *post-mortem* study, if the causes of disease losses in turkeys were to be properly studied. There has been some improvement in this respect, but not enough.

Surveying the cases which his Station had dealt with, Dr. Gordon said that approximately 65 per cent. of the cases were due to four conditions—salmonellosis, blackhead, coccidiosis, and sinusitis—the first two each representing about 20 per cent. of the total.

Isolation of *Bacillus anthracis* from Soil: The Use of Pearce and Powell Selective Medium

BY

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IT is well known that the isolation of *Bacillus anthracis* from soils, bone meal, bone manure etc. usually is difficult to achieve, and requires laborious procedures. Minett & Dhandra (1942) in their studies on the multiplication of *B. anthracis* in soil found that the most reliable method for the examination of natural soils experimentally infected with spores of *B. anthracis* was to make suspensions of up to 7 grammes of soil in 20 ml. of saline, then serial ten-fold dilutions of these suspensions in saline; one c.c. of each dilution was inoculated into guinea-pigs, two animals for each dilution.

The object of this communication is to record preliminary observations on the use of the selective medium, described by Pearce & Powell (1951), in demonstrating the presence of *B. anthracis* in natural soils in Ceylon.

The Selective Medium

Pearce & Powell made use of two observations. 1. Van Heyningen (1948) showed that spore-bearing

TABLE I

ISOLATION OF *B. anthracis* FROM SOILS IN CEYLON

Sample	Location and history	Results. Number of colonies on plates 1	2	3	4	5	pH type of soil	Average temperature (air)	Average rainfall	Elevation
C 1	From various spots in the quarantine enclosure used for goats and sheep in the Cattle Mart, Colombo. The last outbreak of anthrax had occurred 11 months before the samples were taken	3	6	0	–	–	Sandy loam with fair amount of iron and quartz gravel. pH 7·3	80° F.	120 in.	20–30 feet above sea level
C 2		0	0	0	–	–				
C 3		10	8	0	–	–				
C 4		0	0	0	–	–				
C 5		5	8	0	–	–				
C 6		0	0	0	–	–				
Kil. 1	From areas in Kilinochi where there have been cases of anthrax six months ago	0	0	0	–	–	pH 6·9. Light sandy loam, non-lateritic	81° F.	65 in.	25 feet above sea level
Kil. 2		0	0	0	–	–				
Kil. 3		0	0	0	–	–				
Kil. 4		0	0	0	–	–				
NE 1	From various spots on the paddocks of a dairy farm, Nuwara Eliya, where there were cases of anthrax in cattle nine years ago	0	0	0	–	–	pH 7·1	59° F.	65·28 in.	6,000 feet above sea level
NE 2		0	0	0	–	–				
NE 3		0	0	0	–	–				
NE 4		0	0	0	–	–				
NE 5		0	0	0	–	–				
NE 6		0	0	0	–	–				
R 1	From Ruhuna National Reserve jungle where carcases of wild elephants were found some weeks previously	0	0	0	–	–				
R 2		0	0	0	–	–				
R 3		0	0	0	–	–				
R 4		0	0	0	–	–				
K 1	Paddock used for detention of goats for five to six days prior to slaughter. Anthrax had been detected in a goat about four days before samples were taken	0	0	0	0	0	Lateritic loam. pH 8·4 moisture content about 4·2	77° F.	62·20 in. Fairly even monthly, but heaviest in Oct.,Nov.,Dec.	1,500 ft. above sea level
K 2		1	1	0	0	0				
K 3		1	2	0	0	0				
K 4		0	0	0	0	0				
J1–J10	Quarantine Station for imported goats in Jaffna, divided into enclosures by walls									
J 1	Soils Enclosure 1	0	0	0	0	0	Grey heavy loam. pH 8·4, fairly rich in calcium	81·6° F.	47·56 in. heavy rainfall in Oct., Nov., Dec. Slight in other months	Slightly above sea level
J 2	Enclosure 2	0	0	0	–	–				
J 3	,, 3	0	0	0	–	–				
J 4	,, 4 Sick section (*a*)	3	1	0	–	–				
J 5	,, 5 ,, (*b*)	2	3	0	–	–				
J 6	,, 6 Tethering pen	1	4	0	–	–				
J 7	,, A	0	0	0	–	–				
J 8	,, B	0	0	0	–	–				
J 9	,, C	0	0	0	–	–				
J 10	Grass (composite sample)	0	0	0	–	–				

aerobes could be divided into species; those which would, and those which would not grow on nutrient agar containing 50 μg haematin per ml; *B. anthracis* was not inhibited. 2. Herbert (1951) found that spore bearing aerobes could be divided into two groups on the basis of their resistance to lysozyme.

Pearce & Powell devised a medium containing both haematin and lysozyme, and after trials with varying amounts of these agents found that a peptone nutrient agar containing 40 μg haematin and 60 μg lysozyme per ml. " was a good compromise." They inoculated plates of this medium with *B. anthracis* spores, incubating one set at 37° to 38° C. and another set at 39° to 40° C. Control plates of ordinary nutrient agar were similarly inoculated and incubated. The results showed that the count of viable spores was as high in the selective medium as in the control medium when incubated at 37° C. and that there was very little lower count in the plates of selective medium incubated at 40° C. The value of this latter observation is that most of the non-pathogenic spore-bearers present in all soils do not grow at 40° C.

In the present preliminary investigation, the technique used was similar to that described by Pearce & Powell (1953), *viz.* one gramme of each soil was ground in a sterile mortar with a little water, then suspended in 1000 ml. of water; 10 ml. of each suspension was transferred to a test-tube and heated to 60° C. for 30 minutes. Five drops, approximately equal to 0.15 ml. was transferred to each plate of selective medium. With some samples, three plates, with others, five plates were inoculated; these were incubated at 37° C. for about 18 hours, when they were examined by the naked eye and under the low power of the microscope. Colonies typical of *B. anthracis* (frosted glass appearance, distinct filamentous structure) were transferred to tubes of broth and tested for motility and pathogenicity to guinea-pigs.

The results are given in Table I.

Discussion

In this preliminary investigation, the impression has been gained that the use of Pearce & Powell's medium makes the isolation of *B. anthracis* from soils far less laborious than is the case with other media or other procedures. However, the soils found to be infected may be very highly contaminated and cultural examination of much larger amounts of soil suspension may be necessary for samples from less heavily contaminated areas. Further work is in progress.

Summary

1. *B. anthracis* was isolated with comparative ease, from eight samples of soils in Ceylon, using the selective medium and procedure described by Pearce & Powell (1951).

Acknowledgments—Thanks are due to Dr. D. Seneviratne, Municipal Veterinary Officer, Kandy; Dr. S. C. Alagaratnam, Government Veterinary Officer, Jaffna; Dr. G. Pararajasingham, Government Veterinary Officer, Kilinochi; Dr. Saravanamuttu, Acting Chief Veterinary Surgeon, Municipality of Colombo; Dr. P. C. C. Ratnatunga, Government Veterinary Officer, Nuwara-Eliya; Mr. C. W. Nicholas, Warden of Wild Life, Ceylon, for sending the samples of soil; also to Mr. D. Maheswaran, B.SC., Biochemist, Pathology Laboratory, Civil Hospital, Kandy, for making the solutions of haemin and lysozyme.

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New Salary Scales for State Veterinary Officers

Group of Professional Classes in July, 1953 (Award No. 227), with effect from the same date.

It was estimated that the cost of the claim would be approximately £36,000 per annum and that the cost of the Ministry's offer would be approximately £16,000 per annum.

The details of the agreed award were precisely those claimed by the Association, and were as follows:—

(a) That the salary scales (London, male) of the following grades in the Veterinary Services of the Ministry of Agriculture and Fisheries shall be: Veterinary Officer, Assistant Veterinary Investigation Officer, and Research Officer—£635 (at age 23) x £35—£670 x £25—£770 x £30—£800 x £60—£860 x £35—£1,070 x £40—£1,260; Divisional Veterinary Officer, Veterinary Investigation Officer, and Senior Research Officer II—£1,320 x £50—£1,645.

(b) That normal Civil Service three-tier provincial differentiation shall apply.

(c) That the above scales shall be consolidated scales and shall have effect from January 1st, 1953.

(d) That the " corresponding points " principle shall be applied in the assimilation to the new scales of officers in post.

It should be emphasised that these measures are merely a cost-of-living adjustment to the present salary scales, and that they bear no relation to those claimed by the Association of State Veterinary Officers as necessary to give the veterinary surgeon a status commensurate with his training and responsibilities.

The main claim involving the status of the whole-time veterinary officer is still being pursued by the Association in collaboration with the Institution of Professional Civil Servants.

Current Literature

W.H.O. Technical Report Series. (1954). No. 82. "Expert Committee on Rabies. Second Report."

This report contains a review of knowledge gained in the last three years on various aspects of rabies control. For prophylaxis of humans exposed to rabies accumulated experimental evidence has demonstrated the efficiency of hyperimmune serum given within 72 hours of exposure. This gives detectable antibody in the patient's serum from the 1st to 14th day after exposure (0.5 ml. per kg. bodyweight). By giving a course of 14 daily doses of phenolised vaccine as well as immune serum, antibody is present for at least 28 days. Wounds from rabid animals may be infiltrated with immune serum. For the immunisation of dogs and cats, a single inoculation of egg adapted Flury or Kelev strains of virus are recommended. Thus, Flury strain at the level of 40th to 50th egg passage immunises dogs for at least three years to resist experimental challenge and has given good results in mass immunisation of dogs in Israel and Malaya. Preliminary experiments showed that after 180 passages in eggs, it was safe for inoculating cattle and yet had retained its immunising properties. At present, egg vaccines are not recommended for human prophylaxis. Measures for the control of rabies are given, including recommendations with respect to the international transfer of animals. Vampire bats continue to be a source of rabies in Mexico, Central America and South America and rabid insectivorous bats have recently attacked man in Florida and Pennsylvania, U.S.A. For detecting rabies, the report stresses the necessity of performing animal inoculation tests for the isolation of virus in addition to normal microscopic examinations.

A. W. G.

Newcastle Disease Virus in Man. SILCOCK, H. G. (1954). *St. vet. J. Minist. Agric. Lond.* **9**, 10–12.

The author reminds us that when the epizootic of fowl pest started in this country in 1947 it was not generally realised that association with affected fowls could give rise to a conjunctivitis in man. A review of the literature in 1949 stated that only a few sporadic cases had been recorded. Difficulties were reported in the interpretation of the serological tests, and it was suggested that the conjunctivitis might be confused with other virus infections unless the actual virus of Newcastle disease could be isolated. This was achieved in one case in 1950, when material taken from a unilateral conjunctivitis that had developed two or three days after contact with infected birds, caused typical symptoms of Newcastle disease when injected into a healthy fowl.

The author reports a further 19 cases of conjunctivitis observed during the course of the 722 outbreaks of fowl pest that have occurred in Herts, Middlesex and London since 1947. Many of these cases were associated with outbreaks of the sub-acute form of fowl pest in intensively kept birds, and the author attributes this to the greater build-up of infection that can occur in such outbreaks. The conjunctivitis affected either one or both eyes, causing a copious, watery exudate. In every case the diagnosis was based on circumstantial evidence, as no laboratory examinations were made. Recovery was usually complete within two weeks and was hastened by the use of a sulphacetamide eye lotion. One veterinary officer was affected on four separate occasions. E. A. G.

Living Modified Viruses as Immunising Agents. Cox, H. R. (1954). *Brit. med. J.*, July 31st, 1954, pp. 259–264 (83 refs.)

Author surveys the use of living modified viruses as immunising agents. Whereas vaccines against fowlpox, infectious bronchitis, laryngotracheitis, Newcastle disease, pigeon pox and vaccinia are viral strains of relatively low pathogenicity recovered directly from their natural hosts, vaccines against African horse sickness, blue-tongue, canine distemper, swine fever, rabies, rinderpest and yellow fever are experimentally induced variants of the viruses, which are of reduced virulence for natural hosts. Vaccines against yellow fever are produced from virus passaged intracerebrally in mice. Dried mouse brain may be used as vaccine (French neurotropic strain) or it may be further attenuated by passage in mouse embryo tissue and then chick embryo (17D strain). Immunity induced lasts for at least nine years. Anti-rabies vaccines of various types (including the classical Pasteur vaccine) have been prepared from infected nervous tissues. Recently, vaccine has been prepared from the "Flury" strain of rabies which had been passed intracerebrally in day-old chicks and was then adapted to the chick embryo. A single injection induces a lasting immunity (more than three years) and avoids the side-effect of demyelinating encephalitis which may follow the injection of nervous tissue. Passage of strains of blue-tongue virus in fertile eggs has led to the development of a quadrivalent vaccine which is avirulent and immunises satisfactorily, provided too great a number of egg passes are not made. The virulence of the attenuated virus cannot be restored by passage in sheep. Likewise, swine fever vaccine, prepared by adapting the virus to rabbits, does not recover its virulence by passage in pigs. Experimental vaccine against type two poliomyelitis has been prepared from formalised virus grown in tissue culture. The author favours an attempt to produce attenuated virus vaccine for administration per os. A promising trial with rodent adapted virus used in this way has been carried out. Moreover, MEF1 strain of type 2 virus has been adapted to grow in fertile eggs, and the author hopes that this will be accomplished with strains of types one and three. He emphasises throughout that living attenuated viruses are capable of producing more durable immunity than inactivated viruses.

A. W. G.

CALL-UP OF VETERINARY SURGEONS

The B.V.A. has received information from the Ministry of Labour with regard to the call-up for National Service of veterinary students completing their studies in 1955.

It will be recalled that the arrangement last year was that the call-up of veterinary graduates qualifying in 1954 could be deferred for a maximum of 12 months so that they could obtain immediate clinical and practical experience in agricultural practice.

The Ministry has decided that this concession shall apply again, and on the same conditions, to those qualifying in 1955.

News and Comment

BURNS SUPPER AT LASSWADE

On Tuesday, January 25th, a gathering of about 60, comprising the staff of the Veterinary Laboratory of the Ministry of Agriculture and Fisheries at Lasswade and friends, attended a Burns Supper at Eskgrove. The guests included Mr. A. Glen, C.B., M.C., Secretary of the Department of Agriculture for Scotland, the Chief Veterinary Officer, Mr. J. N. Ritchie, Mr. C. P. Quick, Assistant Secretary, Ministry of Agriculture and Fisheries, The Director, Dr. Stableforth, and Mr. J. A. Aldridge, from Weybridge, Captain Norman Bisset, Dr. Greenwood, Director of the Poultry Research Centre, Dr. J. T. Stamp, Director of the Animal Diseases Research Association, Professor Robertson and Mr. R. Hood from the Royal (Dick) School of Veterinary Studies, Dr. J. Russell Greig, Mr. Lauchlan Macpherson, Mr. R. Paisley from Messrs. May & Baker, Messrs. R. J. & M. Scott, of Melville & Hunter, Edinburgh, Mr. G. Dalling and several members of the Ministry of Works, including Messrs. McMinn and Dalrymple, District Surveyors. Through a last minute alteration in his programme Sir Thomas Dalling was prevented from being present. The haggis was piped in in traditional fashion by Pipe Major Crombie of the Royal Scots, and addressed by Mr. J. E. Wilson who presided. "The Immortal Memory" was proposed by Captain Bisset, and Dr. Stableforth toasted "The Lasses." Dr. Russell Greig recited "Tam o' Shanter" in his own inimitable fashion. The company was entertained to a programme of Scots songs and dancing by the laboratory choir and team of country dancers.

1954 AGRICULTURAL RETURNS (DEC. 1954)

The December, 1954, agricultural census in England and Wales shows increases in total numbers of livestock, except sheep, as compared with December, 1953. The total number of cattle (including calves) returned was 8,002,000, an increase of 143,000 (2 per cent.). Cows and heifers in milk (including beef cows) declined by 31,000 (1 per cent.), but dry cows increased by 48,000 (6 per cent.) and heifers in calf by 19,000 (4 per cent.). Bulls and bull calves were lower by 8,000 (8 per cent.). Among "other cattle," males under one year old increased by 21,000 (4 per cent.), while females in this group showed a slight decline; in the one year old and under two years categories, males increased by 71,000 (16 per cent.) and females by 44,000 (4 per cent.). In the two year old and over classes both males and females showed decreases, which totalled 14,000 (1 per cent.).

The total number of sheep and lambs returned, 11,006,000, was 510,000 lower (4 per cent.) on the year. Ewes for breeding increased by 352,000 (7 per cent.), while the number of shearling ewes remained unchanged. "Other sheep" of one year old and over were fewer by 192,000 (26 per cent.). Sheep and lambs under one year old numbered 3,614,000, and were 678,000 (16 per cent.) less than a year ago.

The total of pigs reached 5,555,000, an increase over the year of 932,000 (20 per cent.). Gilts in pig declined by 33,000 (27 per cent.), but sows in pig increased by 36,000 (12 per cent.) and other sows for breeding by 34,000 (19 per cent.). Each age group of "all other pigs" was substantially higher.

Fowls six months old and over showed a slight decrease, but fowls under six months increased by 1,643,000 (29 per cent.). Ducks, geese, and turkeys of all ages declined by 203,000 (7 per cent.).

SECOND REPORT OF THE ADVISORY COMMITTEE ON MYXOMATOSIS

The Second Report of the Myxomatosis Advisory Committee, published on January 27th, is mainly a progress report on the spread of the disease during 1954. When the First Report of the Committee was made in March last there had been 12 isolated outbreaks of myxomatosis in wild rabbits in four counties in south-east England, but by the end of December, 1954, the disease had spread extensively all over Wales and the southern half of England, while scattered and widely distributed outbreaks had occurred over the rest of England and Scotland. The Committee have no doubt that the disease will survive the winter and that there is no way of preventing it from spreading widely during the coming spring and summer.

Mosquitoes appear to have played little or no part as carriers of the disease during 1954; the chief insect responsible for the spread of the disease has been the rabbit flea. Birds and other predators and scavengers may have carried the disease longer distances by acting as temporary hosts of infected fleas.

The virus has been extremely virulent in Great Britain during 1954, and the Report suggests that less than 1 per cent. of affected rabbits have survived; but experience in Australia and elsewhere suggests that the number of immune survivors may increase in future years.

Where rabbits have been largely eliminated there has been a marked improvement in grass and other crops, but the Report draws attention to a problem that may arise on unploughable land, such as steep chalk downland pastures, where the only grazing animal in recent times has been the rabbit. This aspect is being further examined by the Ministry and consideration is being given to the need to restock such areas with sheep or cattle.

The Report also refers to the steps taken to protect domestic rabbits; the effect of the disease on trapping and sale of rabbits; the possible effect of predators; and developments in Australia and Europe.

RINGWORM

The Technical Development Committee has, in the past year, held preliminary discussions on the subject of ringworm in large and small animals. A joint discussion was held with representatives of the Medical Mycology Committee of the M.R.C., following a request from them for an investigation into mycoses occurring in animals.

The Technical Development Committee is now collecting information on the incidence of the condition, reservoirs of infection, methods of diagnosis, treatment, etc., and for this purpose has sought the help of the veterinary schools, The Animal Health Division and individual members of the profession. A mycologist, Mr. P. K. C. Austwick, B.SC., has been appointed at Weybridge to undertake an investigation into mycoses of animals. Members will have seen the report of his two-year survey carried out in conjunction with Dr. G. C. Ainsworth, B.SC., F.L.S., published in THE RECORD on January 29th, which covers a very wide field and indicates the high relative importance to veterinary science of the study of mycoses. Facilities are being provided at Weybridge for a diagnostic service in both large and small animals and this is available for use by members of the profession. Material may be sent, *clearly labelled* "Mycosis" and addressed to:—

The Director, Ministry of Agriculture & Fisheries, Veterinary Laboratory, New Haw, Weybridge, Surrey.

The Technical Development Committee is most anxious to secure the fullest possible information from members of the profession on mycoses in general, and would be glad to receive reports from members, in however brief a form.

IMPORT OF POULTRY CARCASES

The Minister of Agriculture and Fisheries has made an Order under the Diseases of Animals Act introducing some minor changes in the animal health regulations governing the import of poultry carcases. The Order, which is entitled "The Poultry Carcases (Landing) Order, 1955," comes into operation on March 1st. From that date Iceland, the Isle of Man, Guernsey, Alderney, and Sark are added to the list of countries from which poultry carcases may be imported without any animal health conditions. (Jersey is already on the list).

Argentina has been transferred to the group of countries from which imports must be accompanied by a certificate of origin (in the form laid down in the Order); Finland has been added to this group.

The full amended list of countries from which poultry carcases may be imported without any animal health conditions is: Australia; Channel Islands; Iceland; Isle of Man; New Zealand; Northern Ireland; Republic of Ireland; Southern Rhodesia; Uruguay.

The countries from which imports must be accompanied by a certificate of origin are: Argentina; Denmark; Finland; Norway; Sweden.

THE QUEEN TO VISIT CAMBRIDGE

It is announced that the Queen and the Duke of Edinburgh will visit Cambridge on October 20th. One of the principal official functions to be performed by Her Majesty on that occasion will be the opening of the new University Veterinary School.

NEW HONORARY ASSOCIATES OF THE R.C.V.S.

Readers of THE RECORD will learn with pleasure of a current announcement made by the President of the Royal College, Dr. W. R. Wooldridge, that the Prime Minister, Sir Winston Churchill, and the Duke of Norfolk, Earl Marshal of England, have been pleased to accept the invitation of the Council to become Honorary Associates of the Royal College of Veterinary Surgeons. The honorary associateship is the highest honour which it lies within the power of the Royal College to confer, and it is a source of the greatest satisfaction that two such illustrious names have been added.

PERSONAL

Birth

FULLER.—On January 28th, 1955, at 22, London Road, Sittingbourne, to Anne (*née* Knowles), wife of A. T. Fuller, B.SC., M.R.C.V.S., a daughter, Caroline Rose.

Marriage

HOLCOMBE—NOUSIAINEN.—The wedding took place at The English Church, Helsinki, Finland, on May 26th, of Vet. Med. Cand. Raili Nousiainen, elder daughter of Major & Mrs. H. Nousiainen, of Jyväskylä, Finland, and R. B. Holcombe, B.SC., M.R.C.V.S., only son of Mr. & Mrs. H. J. Holcombe, of Weston-super-Mare, Somerset.

COMING EVENTS

February

15th (Tues.). Annual General Meeting of the Eastern Counties Division, B.V.A., at the Bell Hotel, Norwich, 10.45 a.m.

16th (Wed.). Meeting of the Section of Comparative Medicine, Royal Society of Medicine, at the Zoological Society of London, Regents Park, N.W.1, 5 p.m.

17th (Thurs.). Annual General Meeting of the South Eastern Division, B.V.A., at the Royal Star Hotel, Maidstone, 2.30 p.m.

General Meeting of the Herts and Beds. Division, B.V.A., at 70, Holywell Hill, St. Albans, 7.30 p.m.

23rd (Wed.). Joint Meeting of the Society of Practising Veterinary Surgeons and the Central Division, B.V.A., at the Royal Veterinary College, Camden Town, N.W.1, 2.30 p.m.

Annual General Meeting of the Scottish Metropolitan Division, B.V.A., at the Royal (Dick) School of Veterinary Studies, 2.30 p.m.

Annual General Meeting of the Scottish Metropolitan Division, B.V.A., in the Royal (Dick) School of Veterinary Studies, Edinburgh, 2.30 p.m.

24th (Thurs.). Meeting of the Essex Division, B.V.A., at the Essex Institute of Agriculture, Writtle, 7.30 p.m.

Spring Meeting of the Dumfries and Galloway Division, B.V.A., in the Station Hotel, Dumfries, 2.30 p.m.

25th (Fri.). Annual General Meeting of the Midland Counties Division, B.V.A., at the Birmingham Medical Institute, 154, Gt. Charles Street, Birmingham, 11 a.m.

Liverpool University Veterinary Society Annual Ball, in the Students' Union, Brownlow Hill, Liverpool 7, 8 p.m.

March

9th (Wed.). Ordinary Meeting of the A.V.T. and R.W.'s (Northern Region) in the Veterinary Hospital, Pembroke Gardens, Liverpool 3, 2 p.m.

April

30th (Sat.). Association of State Veterinary Officers Annual General Meeting and Dinner in London.

May

6th (Fri.). Royal Veterinary College 163rd Annual Ball at the Hyde Park Hotel.

June

10th (Fri.). Annual Dinner of the R.A.V.C. Officers' Club, at Grosvenor House, Park Lane, London.

September

4th to 10th, 73rd Annual General Meeting and Congress of the British Veterinary Association at Belfast.

ADDRESSES OF DISEASE-INFECTED PREMISES

The list given below indicates, first, the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax

Angus. Meikle Coul, Tannadice, Forfar (Feb. 1).

Ayr. Longhill Farm, Crosshill, Maybole (Feb. 2); Half Merkland Farm, Dalrymple (Feb. 3).

Banff. Burnside Farm, Keith (Jan. 31).

Carmarthen. Pantglas Farm, Llanginning, St. Clears (Feb. 2).

Cumberland. Kirkbarrow, Tirril, Penrith (Jan. 31); Scale Houses, Renwick, Penrith (Feb. 2); Whitrigg Grange, Kirkbride, Carlisle (Feb. 3).

Derby. Top Farm, Burnaston; Brook Farm, Bradley, Ashbourne (Jan. 31); Old Engine Farm, Ashover, Chesterfield (Feb. 1); Gate House Farm, Kirk Langley (Feb. 2).

Durham. Bradley Hall Farm, Medomsley, Consett; Birkside Farm, Blanchland, Consett (Feb. 1).

Hereford. Callow Hills Farm, Ledbury (Feb. 1).

Lancs. Hambleton Hall Farm, Hambleton, Blackpool (Feb. 3).

Lincs. Lowfield Farm, North Willingham (Jan. 31).

Norfolk. East Hall Farm, Wiverton Road, Langham, Holt (Feb. 3).

Notts. Lamcote Farm, Water Lane, Radcliffe-on-Trent (Feb. 3).

Salop. Oak Farm, West Felton, Oswestry (Jan. 31).

Yorks. Langbaurgh Grange Farm, Great Ayton, Middlesbrough; Red House Farm, Hunton, Bedale; Applegarth Farm, Fryup, Leaholm (Jan. 31); Wrangbrook Allotments, Upton, Pontefract (Feb. 1); Wood Farm, Scarcroft, Leeds (Feb. 2); Fox Hagg Farm, Lodge Lane, Rivelin, Sheffield, 10; Peckfield House Farm, Garforth, Leeds; Coach Road Allotments, Guisley, Leeds (Feb. 3).

Fowl Pest

Essex. Rivermead, Little Waltham, Chelmsford (Feb. 1).

Norfolk. Street Farm, Garvestone, Norwich (Jan. 31).

Yorks. Hall Paddock, Barnborough, Doncaster (Feb. 3).

Swine Fever

Ches. 68, Shrewbridge Road, Nantwich (Feb. 2); Gresty Green Farm, Shavington, Crewe; Brickwall Farm, Audlem, Nantwich (Feb. 3); Astmoor Piggeries, Warrington Road, Norton, Runcorn (Feb. 5).

Cornwall. Polperrow, Tresilian, Truro (Feb. 4).

Essex. Treetops, Bakers Lane, West Hanningfield, Chelmsford (Feb. 2); 24, Straight Road, Boxted, Colchester (Feb. 3); The Lodge, Abridge Road, Theydon Bois, Epping (Feb. 4).

Flints. Blackwood Farm, Penley, Overton, Wrexham (Feb. 3); Millbrook Farm, Bangor on Dee (Feb. 5).

Hunts. The Apiary, Herne Road, Ramsey St. Mary, Huntingdon (Feb. 1).

Lancs. New House Farm, Bryning-with-Warton, Kirkham, Preston; Chadderton Gate Farm, Castleton, Rochdale (Feb. 1); Beech House, Garstang Road, St. Michaels on Wyre, Preston (Feb. 3); Lyon Fold Farm, Blackley, Manchester (Feb. 4).

Monmouth. 36, Liswerry Road, Newport (Feb. 2).

Oxford. Charity Farm, Stonesfield; Castle Gardens Allotments, Banbury (Feb. 1).

Salop. Shawbirch Farm, Wellington (Feb. 2); Home Farm, Coton, Whixall, Whitchurch (Feb. 5).

Surrey. Crewes Place Farm, Warlingham (Feb. 1).

Warwicks. Spring Cottage, Watery Lane, Allesley, Coventry (Feb. 1); Scotland Farm, Frankley Lane, Northfield, Birmingham (Feb. 4).

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

A LEGITIMATE GRIEVANCE

Sir,—When I was a veterinary student of some four weeks' standing, my puppy showed sudden, intense and, to me, alarming vomiting and diarrhoea. I rushed him off to the surgery of the nearest qualified veterinary surgeon. The door was locked and there was no visible information as to when it was likely to be opened. I rang the bell, to no avail.

In my abysmal ignorance and desperation I then took him to a "Canine Hospital" some 400 yards away. He was treated at once and eventually recovered.

I suggest that here lies at least part of the answer to the popularity of the animal clinic in the mind of the layman.

Yours faithfully,

J. A. DOUCH,

6, Shilson Terrace,
Windmill Hill,
Launceston, Cornwall.

January 22nd, 1955.

Salmonella manhattan INFECTION

Sir,—In their recent paper on *Salmonella manhattan* infection in cattle, Arnold *et al.* (1955) mentioned that this organism had been isolated in Great Britain from imported spray-dried egg powder. The fact that this was the only reference given to the occurrence of *S. manhattan* in this country has prompted us to report its isolation from a turkey.

The isolation was made from the apparently normal caeca of a 16-week-old turkey. The bird had died from internal haemorrhage which followed a dissecting aneurysm and resultant rupture of the posterior aorta. The alimentary tract appeared to be normal. The inoculum, which consisted of caecal contents, together with scrapings of the caecal tonsils, was incubated overnight in selenite broth before subculture on to D.C.A. medium. The liver, bile, spleen, testes, duodenal contents, and cloacal faeces were examined in the same way, but with negative results, suggesting that this bird was a latent carrier of the infection. The cultural examination of two other birds from the same batch also gave negative results. These birds also had died from aortic rupture.

The diet consisted of a proprietary food together with home grown cereals. No table scraps or swill were given.

It is interesting to note that about half of this batch of birds died within a few weeks of hatching. These losses were attributed to chilling in the brooder, which had been left without heat for a night, but it is possible that a concurrent infection with *S. manhattan* may also have been present.

In California, Lukas & Bradford (1954) examined 1,148 turkey poults for the presence of Salmonella bacteria and reported that 12 (5 per cent.) of the 241 strains isolated were *S. manhattan*. In nine instances this organism appeared to be the primary cause of disease and to cause a mortality of about 10 per cent. As far as we are aware, however, the isolation of *S. manhattan* from poultry has not previously been recorded in Great Britain.

The identity of the organism was confirmed by the Veterinary Laboratory, Weybridge.

Yours faithfully,

E. A. GIBSON.

Ministry of Agriculture & Fisheries,
Veterinary Investigation Centre,
Cambridge.

January 25th, 1955.

References

ARNOLD, R. M., GUILBRIDE, P. D. L., & GLOVER, R. C. (1955). *Vet. Rec.* **67.** 78-80.

LUKAS, G. N., & BRADFORD, D. R. (1954). *J.A.V.M.A.* **125.** 215-218.

RHODODENDRON POISONING

Sir,—I have written the following remarks on rhododendron poisoning as I feel that the indiscriminate planting of rhododendron bushes in hill sheep districts is very dangerous, and that losses from poisoning from this cause are far more numerous than the Committee, who published the recent B.V.A. publication, are aware of. From their remarks it would appear to be of comparatively rare occurrence, but I can assure the Committee that on one farm alone in the West Riding of Yorkshire, losses from rhododendron poisoning are experienced annually. It is for these reasons that I feel prompted to make the following observations.

Firstly, cases of poisoning occur almost solely in winter months when frost and snow prevail, and hill sheep either come down voluntarily or are brought down from hills. Sheep which, from birth, have had access to rhododendron never appear to eat it, or they learn to leave well alone from an early date. Rams, however, appear to be especially susceptible and I have experienced cases of poisoning when grass is available and even when the rams were receiving supplementary rations. Such cases are usually confined to new introductions into the flock.

As will be appreciated, hill sheep often wander in search of food. When hills are snow-covered they look especially for sheltered places, such as woodlands, and it is often impossible to prevent them gaining access to these. I believe that when hill sheep are subjected to severe weather conditions and are wanting in nutrition, small amounts of rhododendron leaves are eaten readily. They prove extremely toxic, and I have experienced losses annually from rhododendron poisoning during

snowy periods, especially on one hill farm where there are numerous rhododendron bushes in the woods.

I should be grateful for the Committee's observations on the whole subject.

Yours faithfully,

J. F. BOLTON,

189 Devizes Road,
Hilperton, Trowbridge,
Wilts.

February 2nd, 1955.

THE SCHEME FOR ANIMAL NURSES

Sir,—The above scheme is of such vital importance to small-animal practitioners that it seems strange that the publication of full details in the SUPPLEMENT TO THE VETERINARY RECORD, October 30th, 1954, has attracted no comments in THE RECORD.

Study of the syllabus suggests that a competent nurse might be almost as useful as some recent graduates, particularly in radiographic and laboratory techniques—in the former of which no instruction appears to be given at the colleges. Furthermore, their veterinary training might well render the animal nurses a source of great embarrassment to many members of the Supplementary Veterinary Register.

The reasons given for creating this additional group of veterinary workers are that:—

(1) (*Suppt. p. 168, para. no. 5*)—" prospective employers have no criterion for judging the capability of a lay person." Surely any experienced employer would agree that a good personal reference is of more value than the possession of a diploma?

(2) (*Suppt. paras. 6 and 8*)—" that such persons would greatly assist veterinary surgeons whether in practice, University Schools or welfare clinics." As private practitioners will be the class most affected by this scheme they may well prefer employees trained by themselves to their own requirements; the veterinary schools could hardly employ many, and there may well be good reasons for not encouraging their employment in welfare clinics and extending their activities.

The acquisition of the qualification by the animal nurse might well increase the reasonable wage beyond their economic value, and private practitioners might prefer to pay a little more for a young veterinary graduate.

It is difficult to see that the R.C.V.S., even if it was entrusted with their control (which may be uncertain) could exert adequate control over these nurses, as for instance in the following examples which come readily to mind:—

(a) In pet shops—worm treatments, skin and distemper " cures " might be sold to their advantage and first aid undertaken *ad lib*.

(b) Breeding kennels—the animal nurse might easily take in whelping cases with little or no veterinary " cover."

(c) Branch practices—an animal nurse placed in a veterinary branch practice (or welfare clinic) might, when the veterinary staff was fully engaged elsewhere, attend to whelping and emergency cases, might give second injections or even dispense stock or special medicines for cases returning for treatment. All this could be done under the guise of " veterinary supervision " which might be exercised over the telephone —an excellent example of " remote control." In fact, under such circumstances the nurse might almost conduct the evening surgery.

The R.C.V.S. makes the suggestion that control over these nurses could be effected by removal of their names from the Register in serious cases, but it is quite possible that when once the training and course had been completed this might matter very little. They might then be able to advertise, rather on the lines of the old " quack " who used very successfully to describe himself as " not a vet!"

It is to be hoped that the profession will see the weaknesses and dangers of this scheme and reject it forthwith.

Yours faithfully,

J. S. STEWARD,

Veterinary Infirmary,
45, St. James' Street,
Nottingham.

January 31st, 1955.

EQUINE RADIOGRAPHY

Sir,—I was vexed by the implications contained in the letter from the authors of the article " Some Practical Aspects of the Experimental Radiography of the Larger Domestic Animals."

I accept without reservation the statement of the authors that they are in no way indebted to my researches. Nevertheless, they should have been, for my radiographs and radiographic technique, covering their published radiographs, were available to them in the Department of Anatomy at the Royal Veterinary College, from which address they have written their article.

In my letter of September 9th, 1953, to Dr. McCunn, Chief of the Department of Anatomy, I said: ". . . you will find very fair radiographs of the shoulder girdle, cervicle, dorsal, and lumbar spine, pelvis- and hip-joint, etc. Many of the skulls were part of the work I did to decipher the radiographic interpretation—the final result of which rests (undisturbed I think) in the coffers of the R.C.V.S. All I would like in return is some recognition of my work in that sphere."

A number of these radiographs, which were labelled with the technical data and to which the authors should have had access, related to the subject under intravenous chloral anaesthesia, and that work was done at Messrs. Ilford's premises.

Nor, as they suggest, is my memory at fault in this matter. I have now confirmed the facts with Messrs. Ilford who have retained detailed records, and who say: " We can certainly support you in

answering the challenge that the work, before taking the arteriographs, was carried out on a live animal under anaesthesia."

The records and correspondence are available and open for inspection.

The authors have been unfortunate in that, albeit unconsciously, they have in some measure duplicated my work. With the evidence that is now available, I trust that they will admit their claims are not altogether valid, nor is their work quite original.

I feel that the authors should have verified their facts both before publication of such a paper and once again before their reply to my letter of protest.

Yours faithfully,

V. BERWYN JONES,

Frocester Lodge,
Nr. Stonehouse, Glos.

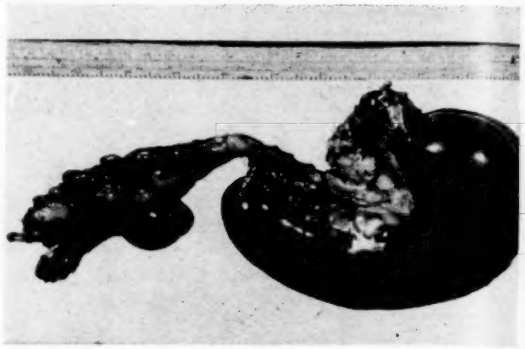
January 30th, 1955.

PYOMETRA

Sir,—The communication by Hogg & Holroyd appearing in your issue of January 8th prompts me to record a similar case that I encountered about 12 months ago. The subject was a 10-year-old Cairn terrier bitch and the owner was under the impression that the bitch was in season. The abdomen was greatly swollen and when percussed one received the impression of a definite fluid "thrill." The animal showed excessive thirst, anorexia and great listlessness. Auscultation of the heart revealed signs of valvular incompetence and the pulse was weak and shallow. A tentative diagnosis of cardiac ascites was made and a heart stimulant and diuretics prescribed. Three days later the animal was definitely worse and was showing signs of toxaemia. The fluid in the abdomen did not appear to collect in the lower half of the cavity, and it was resolved to perform an exploratory laparotomy, the possibility of pyometra or very large cyst formation being borne in mind.

Operation revealed a peculiar condition of the womb, one cornu of which contained a large cystic swelling in part of its length, the remaining portion being apparently normal. The other cornu contained a much smaller cystic swelling, the majority of the cornu being apparently normal. The body of the uterus was normal.

The swellings both contained a clear viscous fluid and the walls of the dilatations were extremely thin. Sections showed a flattening and thinning of the endometrium but the uterine glands were obviously proliferated and there was some evidence of haemorrhage into the endometrium. The apparently normal portions of the cornua showed some degree of proliferation of the endometrium.



If pyometra is due to some hormonal imbalance one would anticipate that the whole uterus would be affected; even if only one ovary was affected then the effect would be generalised via the bloodstream. When only a localised portion of each cornu is affected it brings one to the realisation that the sum of our knowledge of this very important condition is rather scanty.

I enclose a photograph of the affected uterus.

Yours faithfully,

G. T. WILKINSON,

Orford Place,
Norwich.

January 30th, 1955.

SIXPENCE PER C.C.

Sir,—Mr. Miller, in his letter on the above subject has, I fear, failed to appreciate the deeper significance of the new vials.

These are undoubtedly the work of a Communist saboteur of warped mentality, having a special non-sterilisable top, and an inner portion representing the mind and soul of the designer, *i.e.* a square peg in a round hole!

Yours faithfully,

JOHN B. EDWARDS,

1, London Road,
Wellingborough.

January 29th, 1955.

DISEASES OF ANIMALS ACT, 1950—GREAT BRITAIN

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period		Anthrax	Atrophic Rhinitis	Foot-and-mouth	Fowl Pest	Sheep Scab	Swine Fever
1st to 15th January, 1955		34	—	—	40	—	38
Corresponding period in	1954	13	—	—	108	—	61
	1953	68	—	2	86	—	41
	1952	25	—	11	21	—	42

TUBERCULOSIS ORDER OF 1938

The number of bovine animals slaughtered under the Tuberculosis Order of 1938 during the period 1st October to 31st December, 1954, was 414.